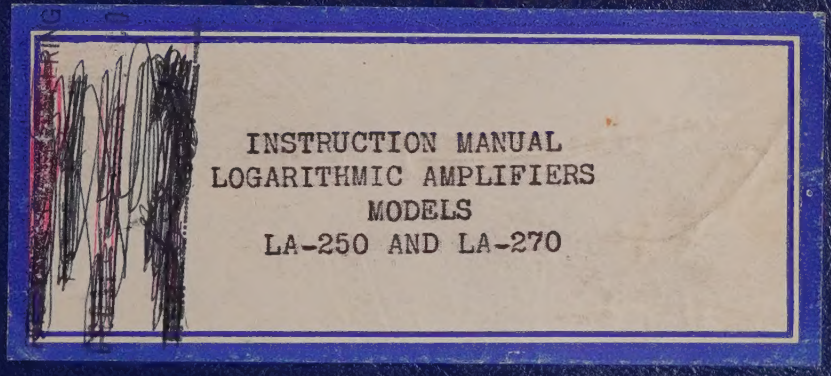
JERROLD

INDUSTRIAL PRODUCTS DIVISION



INSTRUCTION MANUAL
LOGARITHMIC AMPLIFIERS
MODELS
LA-250 AND LA-270

JERROLD ELECTRONICS CORPORATION
The Jerrold Building, Phila. 32, Pa.

JERROLD ELECTRONICS CORPORATION
15th and Lehigh Avenue
Philadelphia 32, Pennsylvania

Instruction Manual
435-237
IP-TIS-003

RF LOGARITHMIC AMPLIFIERS

MODELS LA-250 and LA-270

DESCRIPTION

Jerrold Models LA-250 and LA-270 rf logarithmic amplifiers are designed to permit measurements respectively in the 2 to 50 mc range and the 2 to 70 mc range of attenuation networks which exhibit dynamic ranges of approximately 80 db. These instruments furnish the required gain in an approximately true logarithmic ratio to permit the total response of such networks to be displayed on standard oscilloscopes that are usually capable of displaying only 20 to 30 db of dynamic range.

In the alignment and testing of filters, the ability of these log amplifiers to display a wide dynamic range permits a research specialist or production engineer to observe all changes occurring in the overall response. This eliminates "touch-and-go" methods of alignment which were formerly necessary because only a small area of the total response could be viewed at any one time.

These log amplifiers comprise an rf logarithmic amplifier Model LA-250 or LA-270 (complete with a built-in detector) and a separate power supply Model RPS-150L.

An important feature of these log amplifiers is a LOG-EXPAND control that permits linear expansion of the first 10 db of presentation. This permits accurate measurements of the networks 3 db characteristics as well as other low attenuation characteristics in the 0.25 db to 6 db region while observing the full dynamic range. In addition, a LOG-LINEAR switch permits the selection of either logarithmic or linear amplifier characteristics.

The well-regulated (SOLA transformer) power supply features a variable B+ output with a voltmeter and a milliameter in the circuit, a fixed B- supply, and extensive filtering which holds ripple within 0.02% of the rated B+ and B- voltages.

PROPERTY OF ENGINEERING
TEST EQUIPMENT
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SPECIFICATIONS

AMPLIFIERS

Frequency Range*	(LA-250)	2 mc to 50 mc (3 db points 1 mc and 53 mc)
	(LA-270)	2 mc to 70 mc (3 db points 1 mc and 73 mc)
Response Variation		± 1 db
Sensitivity (as measured at detector)		100 microvolt rf input produces 1 volt dc output.
Logarithmic Characteristics	(LA-250)	80 db input change produces 5 volts dc output change.
	(LA-270)	80 db input change produces 1 volt dc output change.
Undistorted Output (as measured at detector)	(LA-250)	5 volts dc
	(LA-270)	1 volt dc
Noise Output (at maximum gain)		20 millivolts peak-to-peak
Dimensions	(LA-250)	5-1/4" x 19" x 6"
	(LA-270)	5-1/4" x 19" x 4-1/2"
Mounting		Rack-mounted
Shipping Weight		8-1/2 lbs.

POWER SUPPLY

B+ Range	Variable 70 to 200 volts dc @ 150 ma. 0.02% ripple at rated load.
B- Range	Fixed - 150 volts dc @ 20 ma. 0.02% ripple at rated load.
B+ Voltage Meter	0-200 v dc range
B+ Current Meter	0-150 ma. range
Filament	6.3 v ac @ 8.0 amp.
Line Voltage	100 to 130 v ac (117 v ac nominal) 60 cps

Power Consumption	150 watts
Regulation	± 1% from no load to full load
Stability B+	± 1% of indicated voltage over 12 hr. period.
Dimensions	19" x 5-1/4" x 9-1/2"
Shipping Weight	28 lbs.

* Other ranges available on special order

LIST OF CONTROLS, FITTINGS, AND ADJUSTMENTS

MODELS LA-250 and LA-270 (front panel)

NAME	TYPE AND POSITION	FUNCTION
LIN-LOG	2-position switch	
	LIN	LA-250 or LA-270 operates as linear amplifier.
	LOG	LA-250 or LA-270 operates as logarithmic amplifier.
LIN GAIN	Potentiometer	
	Extreme ccw	Minimum linear amplifier gain of LA-250 or LA-270.
	Extreme cw	Provides 20 db gain over minimum linear amplifier gain of LA-250 or LA-270.
LOG EXPAND	Potentiometer	
	Extreme ccw	LA-250 or LA-270 operates as logarithmic amplifier with no linear expansion.
	Extreme cw	Permits linear expansion of the first 10 db of logarithmic presentation of LA-250 or LA-270.

Power Consumption	130 watts
Regulation	± 1% from no load to full load
Stability	± 1% of indicated voltage over 12 hr. period.
Dimensions	19" x 5-1/4" x 9-1/2"
Shipping Weight	28 lbs.

* Other ranges available on special order

LIST OF CONTROLS, FITTINGS, AND ALIGNMENTS

MODELS LA-230 and LA-270 (front panel)

NAME	TYPE AND POSITION	FUNCTION
LIN-LOG	2-position switch	
	LIN	LA-230 or LA-270 operates as linear amplifier.
	LOG	LA-230 or LA-270 operates as logarithmic amplifier.
LIN GAIN	Potentiometer	
	Extreme ccw	Minimum linear amplifier gain of LA-230 or LA-270.
	Extreme cw	Provides 20 db gain over minimum linear amplifier gain of LA-230 or LA-270.
LOG GAIN	Potentiometer	
	Extreme ccw	LA-230 or LA-270 operates as logarithmic amplifier with no linear expansion.
	Extreme cw	Permits linear expansion of the first 10 db of logarithmic response of LA-230 or LA-270.

NAME	TYPE AND POSITION	FUNCTION
INPUT	BNC-type connector	For connection of an rf source within the 2 to 50 mc range to LA-250 or within the 2 to 70 mc range to LA-270.
	MODELS LA-250 and LA-270 (chassis)	
BIAS	Potentiometer	
	Extreme ccw	Minimum bias on AGC amplifier.
	Extreme cw	Maximum bias on AGC amplifier.
COMPRESSION	Potentiometer	Normally set at factory to allow normal level of compression when the input to LA-250 or LA-270 is 1 volt - 20 db*. It may be adjusted clockwise to increase the level of compression. * 20 db is approximately the normal required attenuation in a typical test set-up.
OUTPUT	BNC-type connector	Connects the detected rf output of LA-250 or LA-270 to scope or scope preamplifier. (No external detector is necessary.)
L 1, 4, 7, 10 and 14	Slug-tuned coils	Adjust low middle of response for flatness. Coil L-14 is found on LA-270 only.
L 2, 5, 8, 11 and 13	Slug-tuned coils	Adjust high end of response to 50 mc for LA-250 and to 70 mc for LA-270. Coil L-13 is found on LA-270 only.
L 3, 6, 9 and 12	Slug-tuned coils	Adjust high middle of response for flatness. Coil L-12 is found on LA-270 only.

CONTROLS, FITTINGS and ADJUSTMENTS

MODEL RPS-150L (Power supply)

NAME	TYPE AND POSITION	FUNCTION
B+ C-	Toggle switch	
	ON	B+ and C- energized
	OFF	B+ and C- de-energized
ON - OFF	Toggle switch	
	ON	Energized unit from ac source.
	OFF	De-energizes unit
BIAS ADJ	Potentiometer and switch	
	-150	Extreme counter-clockwise position of control supplies fixed bias of -150 v to LA-250 or LA-270. This is the only position for this switch when used with LA-250 or LA-270.
	0 to -20	Supplies variable bias from 0 to -20 v for use when power supply is used to energize equipment other than LA-250 or LA-270.
B+ ADJ	Potentiometer	Set for 200 v meter reading when power supply is connected to LA-250 or LA-270.

NOTE: A 117 v ac power outlet is mounted at the rear of power supply Model RPS-150L for convenience. This outlet is energized as long as the power cord on RPS-150L is plugged into an ac source whether or not the ON-OFF switch is in ON position.

OPERATIONAL PROCEDURE

INITIAL CHECK

Equipment necessary: Sweep Generator Jerrold Model 707 or equivalent.

20 db pad * Jerrold Model PD 20 or equivalent.

Variable attenuator Model A-52 or equivalent.

Oscilloscope with sensitivity of 1 v per cm for testing LA-250 or with sensitivity of .2 v per cm for testing LA-270.

Log Amplifier Model LA-250 or LA-270

Power Supply Model RPS-150L

* Note: The 20 db pad is used to simulate approximately the normal attenuation in a typical test set-up for a filter. For this set-up, Jerrold recommends at least 10 db isolation at the sweep generator output (to reduce the possibility of "oscillator-pulling") and 6 db isolation at the input and output terminals of the filter.

STEP-BY-STEP PROCEDURE

1. Interconnect equipment

   a. Connect horizontal output of Model 707 to horizontal input of scope.

   b. Connect sweep output of Model 707 to input of 20 db pad.

   c. Connect output of 20 db pad to INPUT of A-52.

   d. Connect A-52 OUTPUT to INPUT of LA-250 or LA-270.

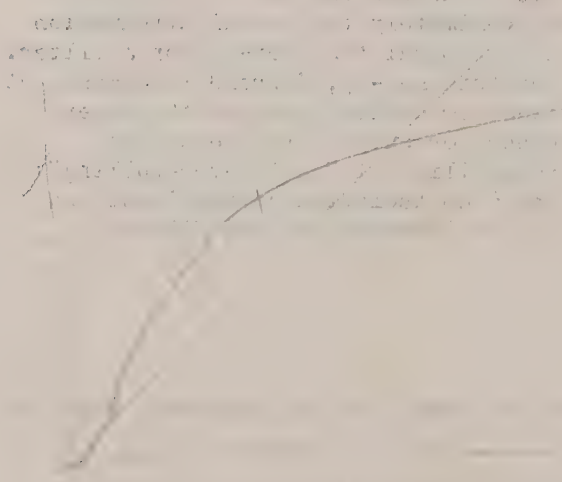
   e. Connect OUTPUT of LA-250 or LA-270 to vertical input of scope.

   f. Connect LA-250 or LA-270 to RPS-150L with cable supplied.

2. Connect Model 707 to 117 v 60 cycle source.

3. Place POWER switch on Model 707 to POWER ON position.

4. Place SW/MIN-SW/SEC switch in 6-60 position and adjust SWEEP SPEED FINE to provide 60 sweeps per second.



5. Place AUTO MAN switch in AUTO position.

6. Place BLANKING switch in REV position.

7. Set CENTER FREQ to any desired frequency between 2 and 50 mc for LA-250 test or between 2 and 70 mc for LA-270 test.

8. Set SW WIDTH control to give desired excursion of sweep.

9. Place PYR SAW switch in PYR position.

10. Connect RPS-150L to 117 v 60 cycle source.

11. Turn ON-OFF switch to ON position and allow 5 minutes warm-up.

12. Turn B+, C- switch to ON position.

13. Place BIAS ADJ switch in extreme counter-clockwise position.

14. Set B+ ADJ for 200 v meter reading.

15. Place LIN-LOG switch on LA-250 or LA-270 to LIN position.

16. Set LIN GAIN 2/3 clockwise.

17. Adjust Model 707 ALC control to provide 1 v output on output meter.

18. Set Scope vertical sensitivity to 1 v per cm for testing LA-250 or to .2 v per cm for testing LA-270.

19. Turn scope ON and center the presentation on the scope with the base line near the bottom. The sweep presentation for LA-250 should be 5 volts above the base line and the sweep presentation for the LA-270 should be 1 volt above the base line. Vary LIN-GAIN control on LA-250 or LA-270 clockwise or counter-clockwise as required if the sweep presentation is not at the proper level. This procedure checks out the linear amplifier section of either the LA-250 or the LA-270.

20. Place LIN-LOG switch in LOG position.

21. Place LOG EXPAND in full counter-clockwise position. The sweep presentation is similar to that in step 19 except that the ripples at the top have flattened out and the right hand slope curves out towards the base.

22. Turn LOG EXPAND control full clockwise. The top of the response should move up towards top of the scope screen and the ripples visible in step 19 should reappear.

23. Set A-52 to provide 10 db of attenuation and presentation should now appear as step 21. If not, adjust the ALC control on Model 707 until presentation appears as in step 21.

24. Re-set A-52 to provide 80 db of attenuation. Presentation should still be visible very close to the base line.

This procedure checks out the log expand function of LA-250 and LA-270 and completes the initial check of either amplifier.

APPLICATIONS

Jerrold Models LA-250 and LA-270 have the advantage of being able to display a wide dynamic range of 80 db over their designed frequency ranges (2 to 50 mc for LA-250 and 2 to 70 mc fro LA-270) in an approximate logarithmic ratio on standard indicating devices such as oscilloscopes and X-Y recorders.

Since these amplifiers contain built-in rf detectors they may be used advantageously as amplifier-detectors for the design and measurement of circuits exhibiting high attenuation characteristics.

These amplifiers also find excellent application in VSWR measurements employing the return-loss technique.

TYPICAL TEST SET-UPS

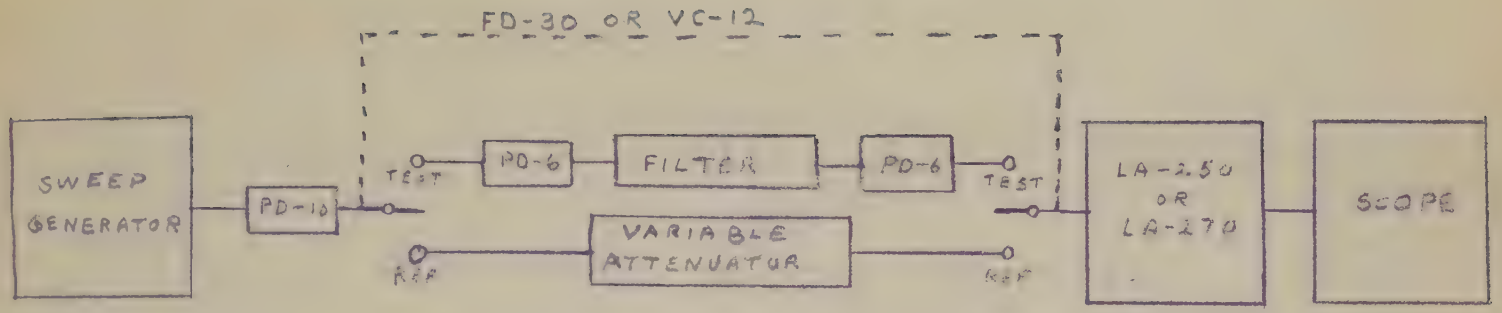
These test set-ups both employ MBC (measurement-by-comparison) techniques. These techniques as well as the Jerrold Model FD-30 voltage comparator are thoroughly described in Jerrold Technical Newsletter Volume 1 Number 1.

The return-loss technique using a matched bridge circuit is fully described in Jerrold Technical Newsletter Volume 1 Number 4.

If variable-rate sweeping is desired a Jerrold Model VC-12 voltage comparator is used in place of Model FD-30.

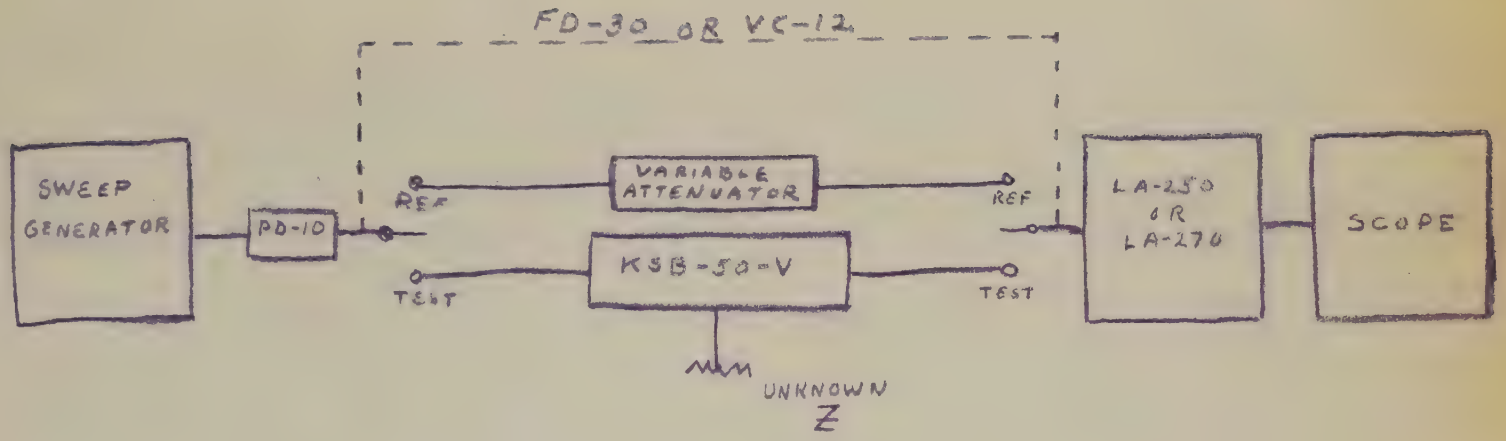
Test set-up for high-attenuation networks.

Note: In testing narrow-band, high dynamic range filters it will be necessary to decrease the sweep rate of the sweep generator to avoid erroneous filter response indications. Example: If a Jerrold Model 707 sweep generator is used with Model FD-30 the sweep rate on Model 707 is set at 30 cps and the switching rate of Model FD-30 is set at 15 cps.

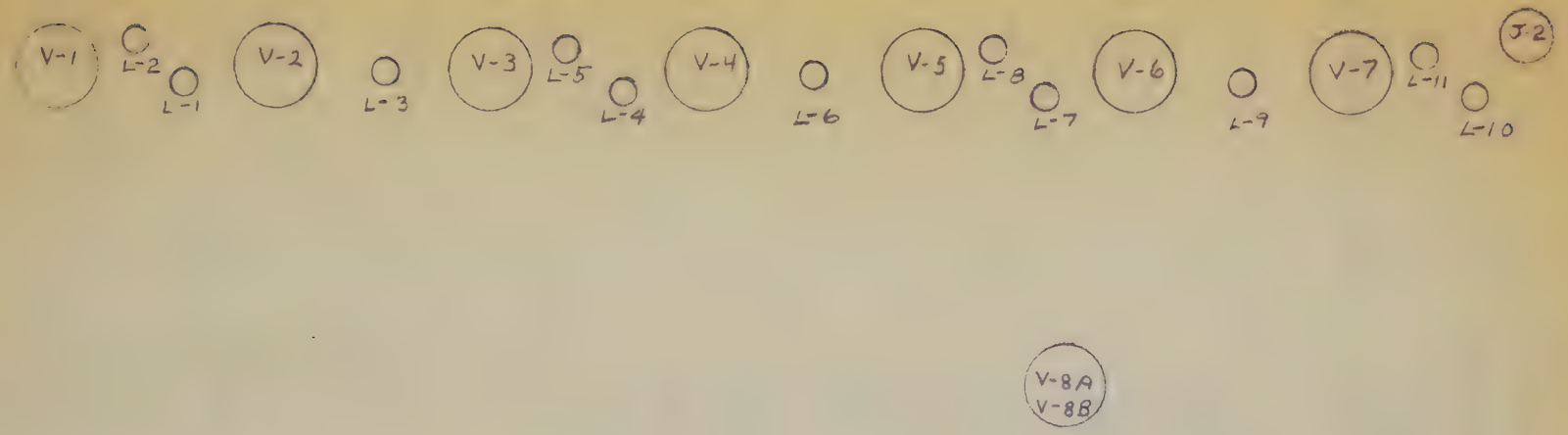


TEST SET-UP FOR HIGH-ATTENUATION NETWORKS

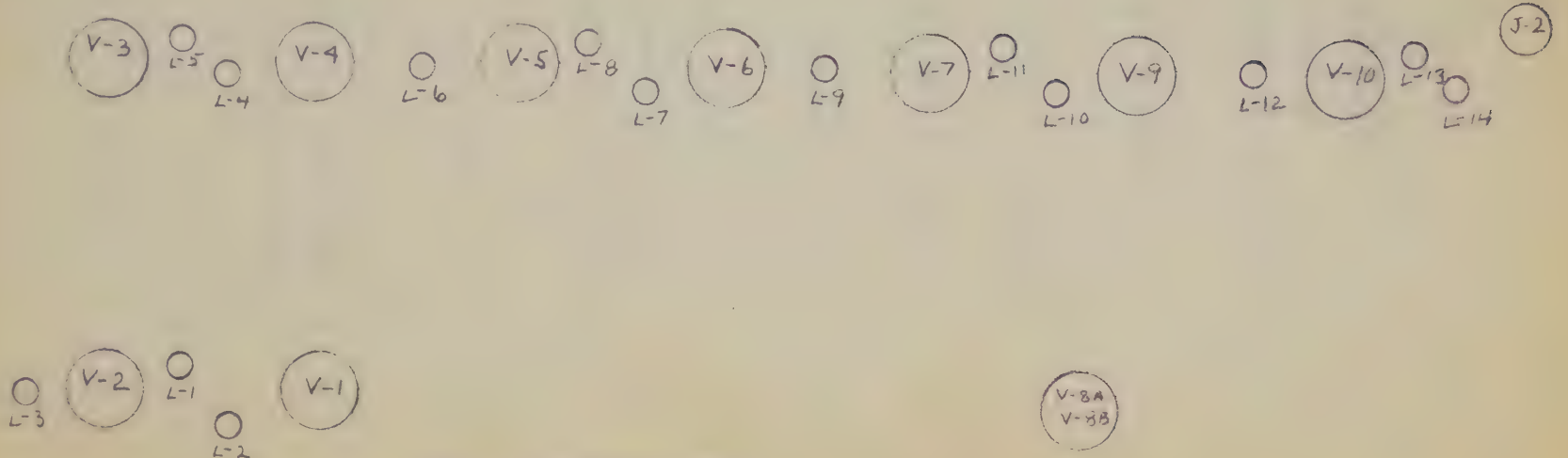
Test set-up for VSWR measurement with a wide-band rf bridge Jerrold Model KSB-50-V or KSB-75-B.



TEST SET-UP FOR VSWR MEASUREMENT



POLE DIAGRAM MODEL LA-250



POLE DIAGRAM MODEL LA-270

REPLACEMENT PARTS LIST

MODEL #LA-250 and LA-270

JERROLD PART #	QUANTITY	SCHEMATIC DESIGNATION	DESCRIPTION
			CAPACITORS
123-108	9	C-1,5,12,17, 22,27,32,36* and 40*	Ceramic 200 mmfd 10%
123-115	10	C-2,9,16,19, 24,29,34,38*, 42* and 48	Disc, 1000 mmfd
125-008	9	C-3,8,13,18, 23,28,33,37* and 41*	Paper-molded .25 mfd/200 v
123-105	8	C-4,7,11,15, 21,26,31 and 43	Ceramic, 100 mmfd 10%
125-043	9	C-6,10,14,20, 25,30,35,39* and 44*	.5 mfd/400 v
124-031	1	C-45	Disc .01 mfd
123-122	3	C-46,47 and 51	Ceramic 50 mmfd 10%
126-052	2	C-49 and 50*	Molded silver mica 5000 mmfd
			FUSE
101-325	1	F-1	.2 amp Slo-Blo
			JACKS
185-106	1	J-1	Bulkhead - BNC UG-909/U
188-103	1	J-1	Receptacle BNC UG-657/U

* LA-270 only
** LA-250 only

JERROLD PART #	QUANTITY	SCHEMATIC DESIGNATION	DESCRIPTION
			RESISTORS
112-200	1	R-1	Fixed carbon 100 ohms ½ w 5%
112-485	9	R-2,9,15,22, 28,35,41,48* and 53*	Fixed carbon 22 k ohms 1 w 10%
112-251	9	R-3,10,16,23, 29,36,42,49* and 54*	Fixed carbon 130 ohms ½ w 5%
112-161	9	R-4,11,17,24, 30,37,43,50* and 55*	Fixed carbon 27 ohms ½ w 5%
112-413	4	R-5,21,33 and 45*	Fixed carbon 2700 ohms ½ w 5%
112-531	9	R-6,12,18,25, 31,38,44,51* and 56*	Fixed carbon 22 k ohms 1 w 10%
	9	R-7,13,19,26, 32,39,46,52* and 58*	Fixed carbon (factory-selected) ½ w 5%
112-362	8	R-8,14,20,27, 34,40,47 and 65	Fixed carbon 1000 ohms ½ w 10%
112-464	1	R-57	Fixed carbon 10 k ohms ½ w 5%
112-236	1	R-59	Fixed carbon 100 ohms ½ w 10%
112-611	2	R-60 and 69	Fixed carbon 100 k ohms ½ w 5%
112-452	1	R-61	Fixed carbon 5100 ohms ½ w 5%
112-632	1	R-62	Fixed carbon 150 k ohms ½ w 5%
112-532	1	R-63	Fixed carbon 33 k ohms 1 w 10%
118-023	1	R-64	Potentiometer 5 k ohms 2 w Lock/Shaft

* LA-270 only
** LA-250 only

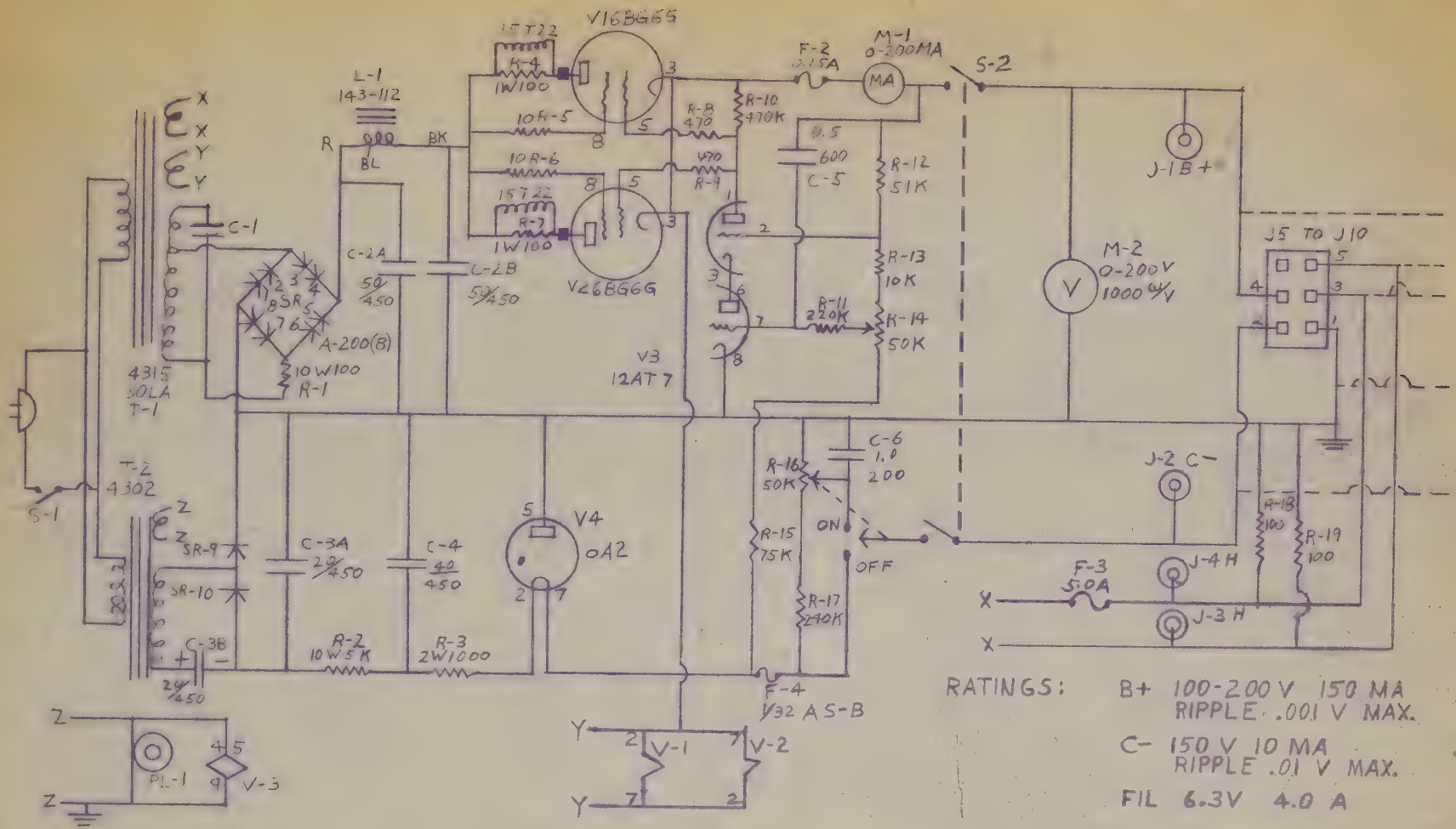
JERROLD PART #	QUANTITY	SCHEMATIC DESIGNATION	DESCRIPTION
			RESISTORS (continued)
112-446	1	R-66	Fixed carbon 4700 ohms ½ w 10%
112-293	2	R-67 and 68	Fixed carbon 300 ohms ½ w 5%
112-710	1	R-70	Fixed carbon 560 k ohms ½ w 10%
118-093	1	R-71	Potentiometer 25 k ohms 2 w ½" Shaft
118-026	1	R-72	Potentiometer 10 k ohms 2 w Lock/Shaft
112-552	1	R-73	Fixed carbon 33 k ohms 1 w 10%
112-374	1	R-74	Fixed carbon 1200 ohms ½ w 10%
112-674	1	R-75**	Fixed carbon 330 k ohm ½ w 5%
112-731	1	R-75*	Fixed carbon 820 k ohm ½ w 10%
118-007	1	R-76	Potentiometer 10 k ohms w/Shaft
112-560	1	R-77**	Fixed carbon 39 k ohms ½ w 5%
112-587	1	R-77*	Fixed carbon 62 k ohms ½ w 5%
			SWITCH
162-007	1	SW-1	Toggle switch SPDT
			TUBES
131-329	1	V8A, V8B	6DJ8 - Amperex
131-339	9	V-1,2,3,4,5,6, 7,9* and 10*	6EH7 - Amperexer
			CRYSTALS
139-100	7	CR-1,2,3,4,5, 6 and 7	IN34 w/leads

* LA-270 only
** LA-250 only

MODEL #RPS-150L SERIES #2

JERROLD PART #	QUANTITY	SCHEMATIC DESIGNATION	DESCRIPTION
			CAPACITORS
	1	C-1	Supplied with Transformer T-1
127-606	1	C-2 (A,B)	Dual-electrolytic (can) 50-50 mfd 450v
127-254	1	C-3	Dual-electrolytic (tubular 20-20 mfd 450v
127-023	1	C-4	Electrolytic (tubular) 40 mfd 450v
125-005	1	C-5	Paper .5 mfd 600v
125-019	1	C-6	Metalized paper 1.0 mfd 200v
			CHOKES
143-112	1	L-1	Choke
			METERS
171-208	1	M-1	Meter 0-200 ma dc
171-209	1	M-2	Meter 0-200 v dc
			PILOT LIGHT
102-002	1	PL-1	Pilot bulb #47
			RESISTORS
113-017	1	R-1	Wire-wound 100 ohm 10w 10%
113-021	1	R-2	Wire-wound 5 k ohm 10w 10%
112-364	1	R-3	Fixed carbon 1,000 ohm 2 w 10%
112-140	2	R-4 and 7	Fixed carbon 100 ohm 1w 10%
112-110	2	R-5 and 6	Fixed carbon 10 ohm ½ w 10%

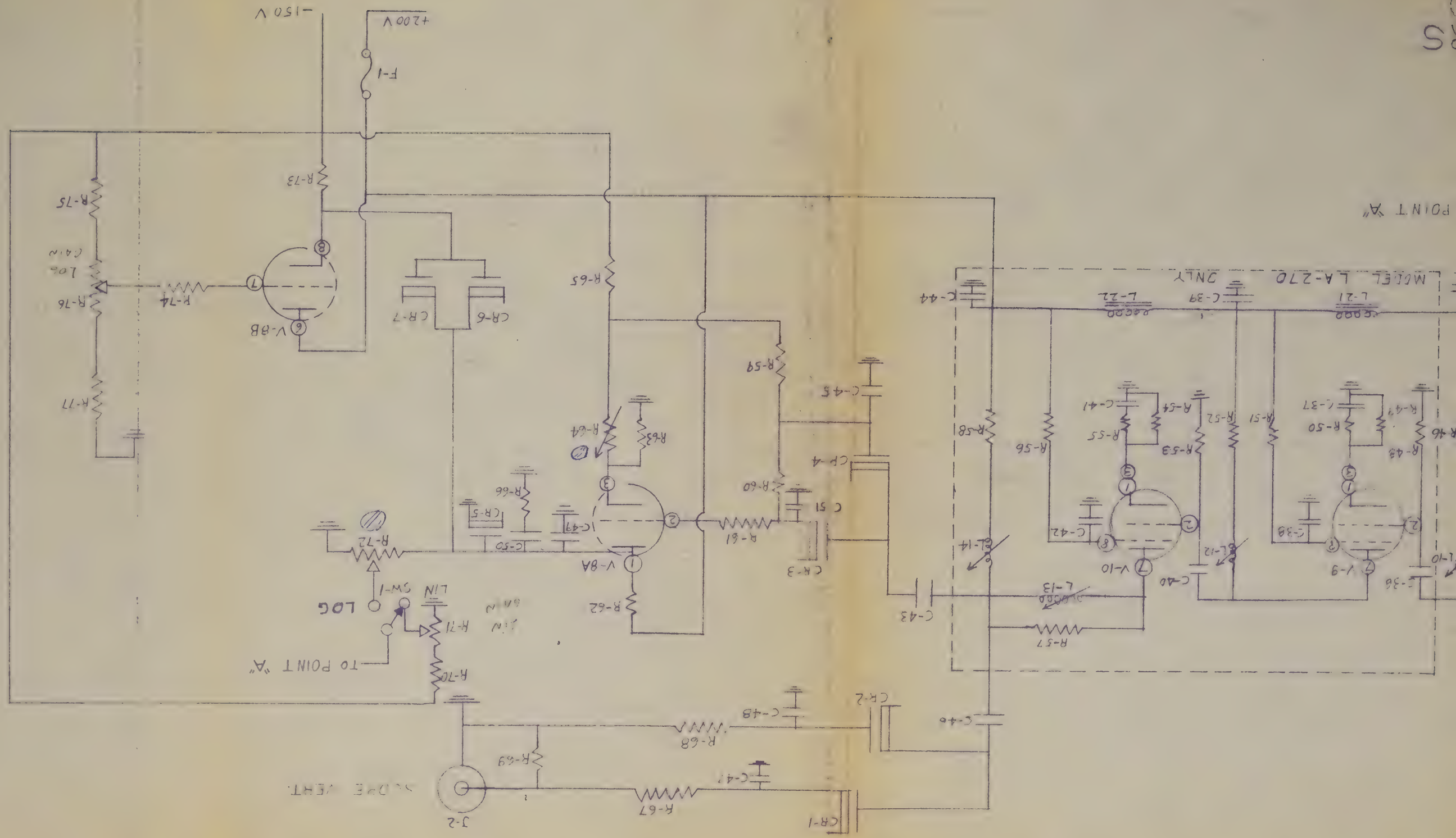
JERROLD PART #	QUANTITY	SCHEMATIC DESIGNATION	DESCRIPTION
			RESISTORS (continued)
112-320	2	R-8 and 9	Fixed carbon 470 ohm ½ w 10%
112-698	1	R-10	Fixed carbon 470 k ohm ½ w 10%
112-656	1	R-11	Fixed carbon 220 k ohm ½ w 10%
112-578	1	R-12	Fixed carbon 51 k ohm ½ w 10%
112-488	1	R-13	Fixed carbon 10 k ohm ½ w 10%
118-016	1	R-14	Potentiometer 50 k 1w linear 10%
112-599	1	R-15	Fixed carbon 75 k ohm ½ w 5%
118-035	1	R-16	Potentiometer 50 k w/spot switch
112-662	1	R-17	Fixed carbon 240 k ohm ½ w 10%
112-236	2	R-18 and 19	Fixed carbon 100 ohm ½ w 10%
			SILICON RECTIFIERS
137-706	10	SR-1,2,3,4,5, 6,7,8,9, and 10	M-150
			TRANSFORMERS
141-115	1	T-1	Transformer SOLA w/capacitor
141-102	1	T-2	Transformer ADO-3
			TUBES
131-336	2	V-1 and 2	6BG6-GA
131-400	1	V-3	12AT7
132-100	1	V-4	OA2

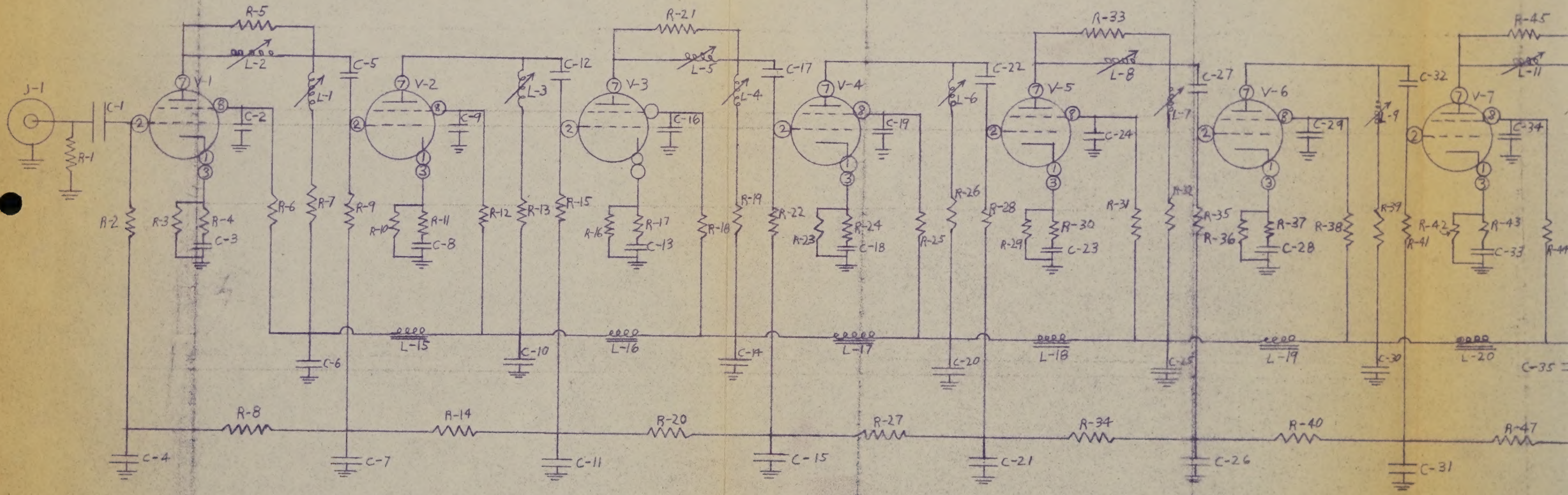


12mv

4mv

POWER SUPPLY
RPS-150L SERIES 2


+200 V
-150 V
F-1
R-73
R-75
R-76
R-77
R-74
V-8B
CR-6
CR-7
R-65
R-59
C-45
R-64
R63
CP-4
R-60
C-51
R-61
V-8A
R-62
R-66
CR-5
C-49
C-50
R-72
LOG
SW-1
LIN
R-71
R-70
TO POINT "A"
C-48
R-68
R-69
C-47
R-67
J-2
CR-2
CR-1
C-46
C-43
C-44
R-58
R-56
R-57
C-42
C-41
R-55
R-54
R-53
R-52
R-51
C-40
C-39
C-38
R-50
R-49
R-48
C-37
C-36
V-10
V-9
L-14
L-13
L-12
L-10
L-21
L-22
MODEL LA-270 ONLY
POINT "A"



LOGARITHMIC AMPLIFIE
MODELS LA 250 AND 27

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